

Geosci. Model Dev. Discuss., referee comment RC2  
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## Comment on gmd-2021-334

Anonymous Referee #2

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Referee comment on "Representing low-intensity fire sensible heat output in a mesoscale atmospheric model with a canopy submodel: a case study with ARPS-CANOPY (version 5.2.12)" by Michael T. Kiefer et al., Geosci. Model Dev. Discuss.,  
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General comments:

The work presented in this manuscript implemented and compared three different fire sensible heat representations in a mesoscale weather model equipped with a canopy module. The work focused on low intensity prescribed fire scenarios which presented a timely study considering the need of such knowledge and tools for the fire risk management in the prescribed burn practices. The three fire sensible heat source representations implemented in the ARPS-CANOPY mode will provide a great tool for future fire studies from mesoscale down to microscale.

Few efforts have been made to cross-compare and assess the suitability/limitation of these methods. Another important contribution of this work is the evaluation of these different fire representations. Utilizing extensive observational data from a field campaign, this work is able to evaluate different fire sensible heat source representation through sensitivity tests and the model-observation agreement.

In my opinion, this is a well written manuscript which presents not only the advancement in the numerical representation of the fire sensible heat source but also with sensitivity tests that provide guidelines for the future studies using the modelling tool. That being said, a few minor revisions might help the readers to better appreciate the work. See below for the minor issues.

- Line 50 to 56. I think the concept of the mesoscale model used here is slightly different from the traditional definition. Traditionally, most of the mesoscale model applications were done using pure parameterization with little or no resolved turbulence like Reynolds-averaged Navier–Stokes equations (RANS) rather than large eddy

simulation (LES) approach. Recommend the author to add one or two sentences to clarify.

- Table 1. The vertical extent/size of each domain should be provided.
- Figure 5. The use of "x" in the figure to indicate minimum and maximum caused overlapping of the symbols in some of the subplots. Recommend to use a smaller "x". A simple figure legend to highlight the observation versus modeled data might also be useful.